Activity #5: Lesson on Linear Equations (Student version)
Math

Note to students: You will work with a partner on this activity. Each student will complete his/her own worksheet.
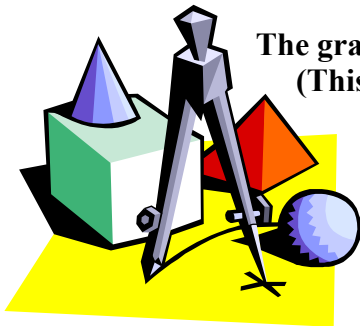
Your name _____

Your partner's name _____

Definition of linear equation:
Any equation that can be written in the form, $Ax + By = C$, where A and B are not both zero. This form is called standard form for linear equations.
(This is the algebra of it!)

The graph of a linear equation will be a straight line.
    (This is the geometry of it!)

        Easy, huh?

         First, let's investigate the algebra of a linear equation.

         To begin, work individually to show or explain why each equation below is or is not linear.
This means, show the algebra of it!

When you have made your responses, discuss each with your partner!

1a. $2x + 3y = 7$ Explain or show why or why not linear.

Does your partner agree? _____
What did you and your partner finally agree, linear or not?

1b. $x - 3y = 9$ Explain or show why or why not linear.

Does your partner agree? _____
What did you and your partner finally agree, linear or not?

1c. –6x = 5   **Explain or show why or why not linear.**

Does your partner agree? _____
What did you and your partner finally agree, linear or not?

1d. 12 = -5   **Explain or show why or why not linear.**

Does your partner agree? _____
What did you and your partner finally agree, linear or not?

1e. 5 – 2y = 0   **Explain or show why or why not linear.**

Does your partner agree? _____
What did you and your partner finally agree, linear or not?

Stop now!
Check your work by discussing, as a class, team results before moving ahead.

Now continue on your own checking the rest of problem 1 with your partner after you both have completed the section.

1f. y = 7x – 2   **Explain or show why or why not linear.**

Does your partner agree? _____
What did you and your partner finally agree, linear or not?

1g. 2x = y + 3   **Explain or show why or why not linear.**

Does your partner agree? _____
What did you and your partner finally agree, linear or not?

1h. y – 3 = 8   **Explain or show why or why not linear.**

Does your partner agree? _____
What did you and your partner finally agree, linear or not?

1i. 0x = 5 – 2y   **Explain or show why or why not linear.**

Does your partner agree? _____
What did you and your partner finally agree, linear or not?

1j. 8 – 0y = 0x   **Explain or show why or why not linear.**

Does your partner agree? _____
What did you and your partner finally agree, linear or not?

Now, work individually and write five equations that are linear and show or explain why. This means, show the algebra of it!
When you have made your responses, discuss each with your partner, and make any necessary changes.

Equation   Does your partner agree?   Make necessary changes.
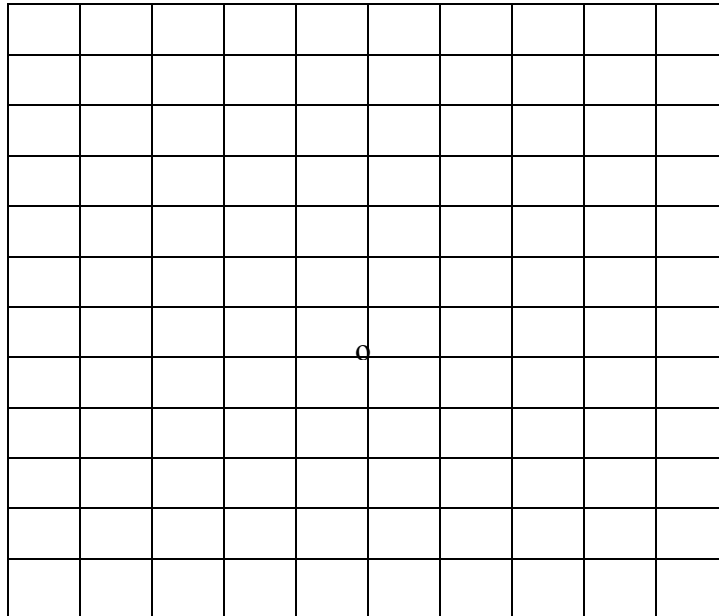
2a. _____
_____

2b. _____
_____

2c. _____
_____

2d. _____
_____

2e. _____
_____

Stop now!

Check your work by discussing your results with another team before moving ahead.

3a. On the grid below, graph the line through the points (5, -2) and (-1, 3).

3b. Find the slope of this line algebraically.
The slope is the change in y compared to the change in x. In other words,

$$\textbf{slope} = \textbf{m} = \frac{change \ \ in \ y}{change \ \ in \ x} = \frac{y_1 - y_2}{x_1 - x_2}$$

Use -2 for y_1 and 5 for x_1. Use 3 for y_2 and —1 for x_2.

3c. Find the slope of the line through (5, -2) and (-1, 3) by counting.

First, pick one point on the line and label it start.
Second, start there and count up or down to another point on the line.
Then, start there again and count right or left to that same other point on the line.
Remember up is + and down is -, right is + and left is -.

slope = m = ---------------- = -------

3d. Does this match your answer in 3b? Why or why not? _____

_____

_____

_____

4a. Graph the line 2x + 3y = 5. To do this, you might first find three integral points.

Of course you know that two points determine a line. The third point is just a safety point --- if the three points do not line up, you've goofed with something and need to double-check your work!

To find the first point with integral coordinates, pick an integer for x, say 2. Now substitute 2 in the equation and solve for y. If y is an integer, then the point is easy to plot and you can use these coordinates.

When you substitute 2 for x, you get   2* 2 + 3y = 5.
**Solving for y, you will get $4 + 3y = 5$**
$$-4 \qquad\quad -4$$
$$3y = 1$$
$$y = \frac{1}{3}$$

Since you did not get an integral value, you need to pick another x. Try x = 3. If 3 gives an integer for y, you will have found one point that is easy to plot. Now you repeat the process until you have three points with integers as coordinates. *It's good to be working with a partner!*

Show your work!   Put your values in the table below.

x	y

4b. Now plot the points and graph the line.
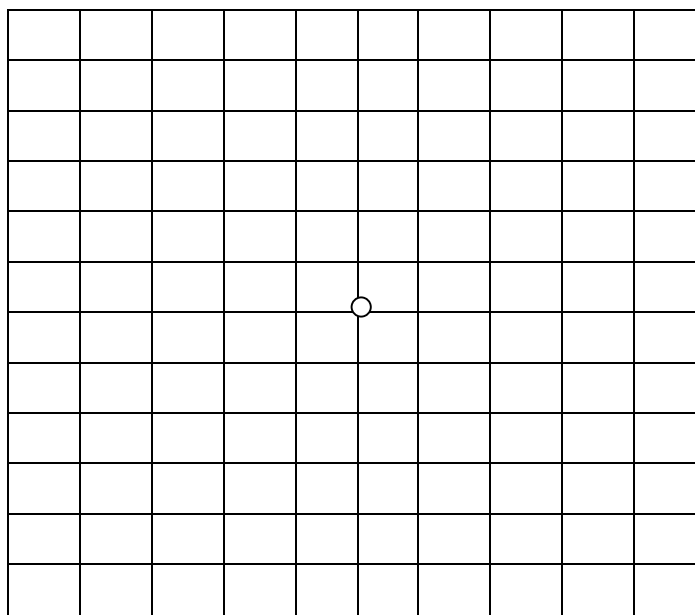
5a. Find the equation of the line that passes through (1, 2) and (-3, 4). Show your work. First, find the slope. Remember that the slope is the change in y compared to the change in x. In other words,
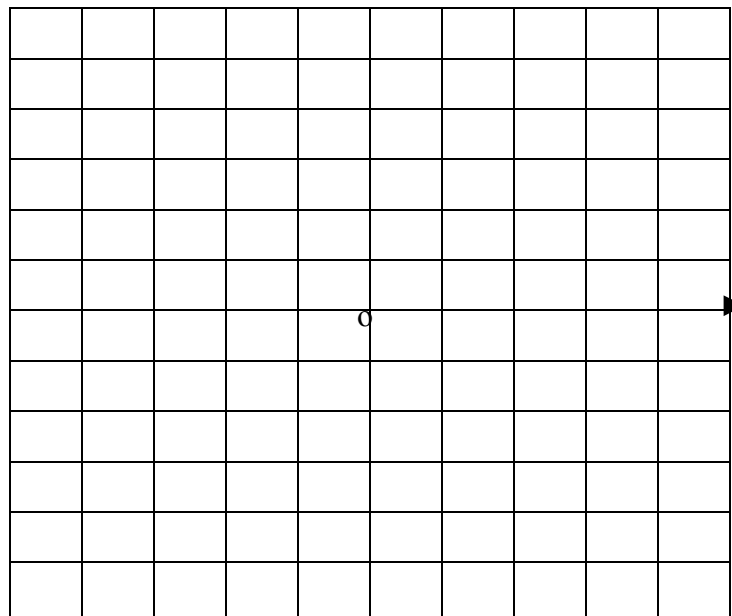
$$\text{slope} = m = \frac{change\ in\ y}{change\ in\ x} = \frac{y_1 - y_2}{x_1 - x_2}.$$

What is the slope? _____

5b. Choose a point. _____ Substitute in the point-slope form for a line,

$$y - y_1 = m\ (\ x - x_1)$$ and simplify so that the x-term and the y-term are on the same side of the equation, putting the equation in standard form. Show all work.
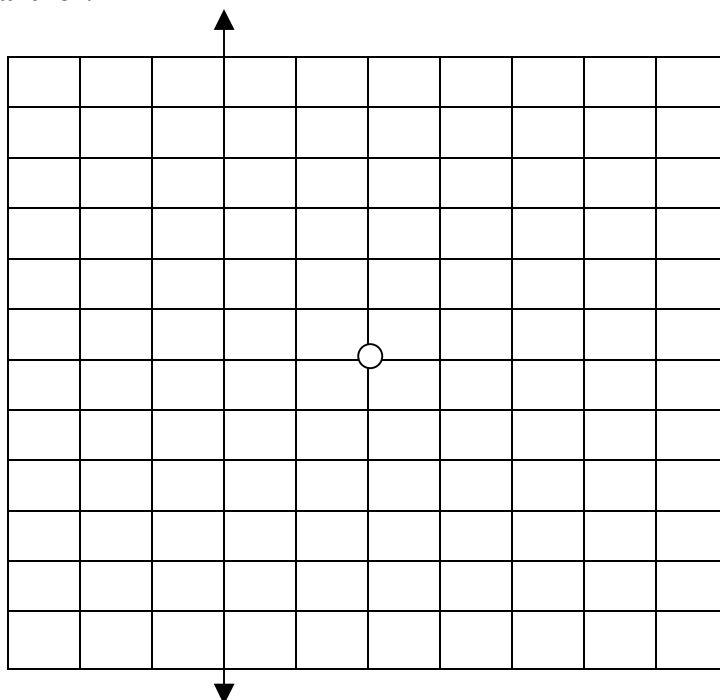
5c. What does your partner think?

5d. Graph the line on the grid below.

6. The graph of the linear equation, 0x + 2y = 6, contains these points: (3, 3)   (4, 3) (5, 3)   (6, 3) (7, 3). *Notice that all the y values are 3!* Graph this linear equation on the grid below.
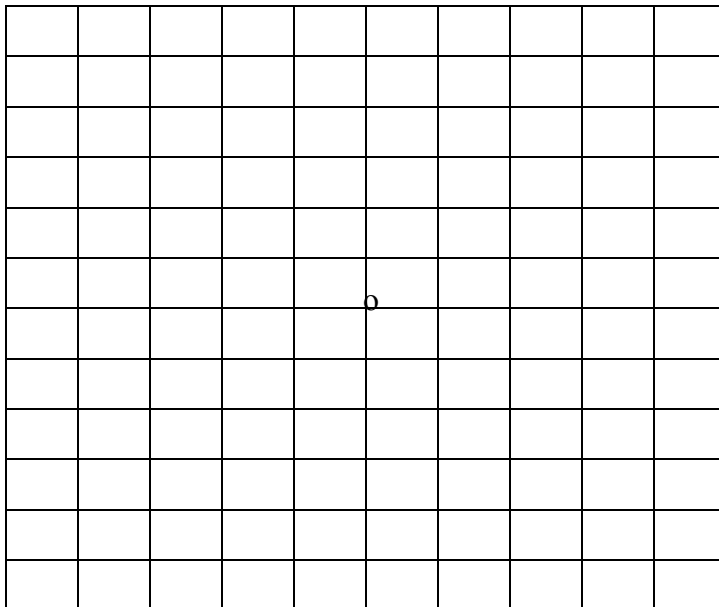
7. Guess the equation of the linear equation graphed below. Discuss possibilities with your partner.

What is your guess? _____

8. Can you make a guess about the equation of a line through points (3, 3), (3, 4), (3, 5), (3, 6), and (3, 7)?

Your guess _____

Why do you make this guess? _____

_____